environment, Luoma points out. Thus, he and others began to study silver and its effects in the San Francisco Bay. Although these researchers tracked the collapse of the bivalve population, which formed much of the base of the fish and bird food webs, “we did not study the microbial community,” he says.

Some observers worry that silver nanoparticles will poison wastewater treatment plants. Doing so “would take massive uses of silver in the commercial sector,” Luoma says. However, if silver ion dishwashers, washing machines, and air conditioners come into wide use, leached levels of nanoparticles might bring this now-remote possibility closer to reality.

In terms of direct risks to humans, “all indications are you would have to have quite a lot of silver in your system to have any impact,” he adds. Further, some people drink colloidal silver as a dietary supplement, and “seem to be healthy.” Silver toxicity comes within its own early warning system. Thus, a blue tinge, called argeria, appears on skin before other ill effects are manifest.

What about microorganisms developing resistance to silver? Products containing silver are used in dressings for trauma wounds, burns, and diabetic ulcers, according to Silver from the Johns Hopkins Bloomberg School of Public Health and Malaria Research Institute (JHMRI) Web summit held this past November.

“Knowing which bacteria best enhance the mosquito’s immunity against infection could have significant implications for the transmission of malaria in the field where bacterial exposure varies greatly from niche to niche,” Dimopoulos says. “Thus we’re using comprehensive functional genomics to identify the mosquito’s core gut microbiome and the molecular interplay between its bacterial residents and the Plasmodium parasites.”

When members of the JHMRI team examined the microbial load and species composition of laboratory-reared Anopheles gambiae mosquitoes, they found great variation in those microorganisms, even between mosquitoes in the same cage. “However, as in previous studies, the majority of isolated bacteria were gram-negative,” Dimopoulos, says. Sequence analyses from morphologically distinct bacterial colonies consistently showed the dominant organisms to be Enterobacter asburiae, Microbacterium sp., Sphingomonas sp., Serratia sp., and Chryseobacterium meningosepticum.

The JHMRI group is also investigating the genes responsible for Anopheles anti-Plasmodium immune responses and has specifically addressed the role of Toll and Imd immune signaling pathways. For instance, the gene caspar, which encodes a regulator of the Imd pathway, controls mosquito resistance to P. falciparum. Importantly, caspar silencing results in resistance to the human Plasmodium parasite in three divergent and major anopheline malaria vector species in South America, Asia, and Africa. This immune response enhancement does not appear to significantly compromise the mosquito’s fitness. Further, the team produced two lines of viable, Imd pathway-enhanced mosquitoes and is working on a third type which combines the im-
HHS Reviewing Countermeasures; IOM Report Updates National Vaccine Plan

In December, Health and Human Services (HHS) Secretary Kathleen Sebelius announced a sweeping review of federal countermeasures approaches to public health threats, including bioterrorism. The ultimate goal is to develop a “modernized countermeasure production process where we have more promising discoveries, more advanced development, more robust manufacturing, better stockpiling, and more advanced distribution practices,” she says. In a separate but related development in December, a panel of the Institute of Medicine (IOM) in Washington, D.C., issued a report identifying 18 priority areas for updating the National Vaccine Plan. They include devising a strategy to accelerate development of high-priority vaccines, expanding funding for safety research and monitoring, and implementing a national communications strategy to clarify the importance of vaccines and to bolster public confidence in them, according to Claire Broome of the Bloomberg School of Public Health. Because mosquito fitness, including a robust reproductive capacity, is critical, he and his collaborators are taking another tack—making the mosquito’s natural bacterial lethal for Plasmodium and feeding those altered bacteria to wild mosquitoes on sugar-impregnated cotton balls. It is easier to grow large numbers of genetically modified bacteria than large numbers of transgenic mosquitoes, Jacobs-Lorena says.

It is one thing to produce transgenic, malaria-resistant mosquitoes but quite another for them to spread their genes to wild-type insects, says Marcelo Jacobs-Lorena, also at the Bloomberg School of Public Health. Because mosquito fitness, including a robust reproductive capacity, is critical, he and his collaborators are taking another tack—making the mosquito’s natural bacterial lethal for Plasmodium and feeding those altered bacteria to wild mosquitoes on sugar-impregnated cotton balls. It is easier to grow large numbers of genetically modified bacteria than large numbers of transgenic mosquitoes, Jacobs-Lorena says.

“Testing for malaria remains a problem, especially in areas where there are taboos against taking blood and suspicion of the few health care workers we have available,” says Web summit participant Sungano Mhara-kurma, who is Scientific Director of the Malaria Institute at Macha (MIAM) in Zambia. Thus, he and colleagues are developing tests that detect P. falciparum antigens and nucleic acid in saliva as accurately as in blood. “We’re also collaborating with scientists at New York University in the U.S. to turn our saliva benchtop assay into a simple, noninvasive, point-of-care diagnostic tool usable at the grassroots level.” This, says Mhara-kurma, will enable trained lay people to find and treat human carriers during the dry season, reducing sources of infected blood for mosquitoes to spread when the rains begin (see Microbe, January 2008, p. 9).

A new approach to monitoring hand hygiene depends on a software applications (app), called iScrub, written and designed for use with the iPhone. The app is being made available free through the iTunes App Store and via iPod, according to Chris Hlady, a graduate student at the University of Iowa (UI), Iowa City. He developed the software as part of a project to automate the monitoring of hand-hygiene practices in health care settings. While designed for hospital staff, iScrub also could become a “stealth app” to keep tabs on whether workers at food-handling or other

mune potency of both its predecessors. Details of this research appear in the March and May 2009 PLoS Pathogens.


Marcia Stone

Monitoring Hand Hygiene, Infectious Diseases with Phone Apps, Twitter

Touchscreen devices and microblogging are being put to ingenious use for tracking infectious diseases and monitoring compliance with disease-preventing hygiene regimens, according to several participants who outlined their approaches to these tasks during the annual meeting of the Infectious Diseases Society of America, held in Philadelphia, Pa., last October.

A new approach to monitoring hand hygiene depends on a software applications (app), called iScrub, written and designed for use with the iPhone. The app is being made available free through the iTunes App Store and via iPod, according to Chris Hlady, a graduate student at the University of Iowa (UI), Iowa City. He developed the software as part of a project to automate the monitoring of hand-hygiene practices in health care settings. While designed for hospital staff, iScrub also could become a “stealth app” to keep tabs on whether workers at food-handling or other

MIAM, detailed information about the dynamics of malaria risk in the area. Concerted antimalaria efforts in the Macha region have drastically reduced the number of cases over the past five years, Thuma says.

The malaria parasite’s apicoplast organelle houses unique metabolic pathways and is likely to provide novel therapeutic targets, according to Sean Prigge of JHMRI. “The main point of the summit [was] highlighting basic research like mine, which is the mission of the JHMRI, and showing how it can augment existing antimalarial strategies,” he says.